

Visual Positioning System for the Formation Flying of Suborbital Vehicles and Spacecraft

Completed Technology Project (2013 - 2016)



Project Introduction

This proposal aims to advance the technology of precision formation flying with the further development of an innovative visual positioning system. This positioning system allows for the precise alignment between multiple spacecraft and precise orientation relative to background stars over large separations. The precision in both relative and absolute position is far greater than that attainable with other current methods and is less reliant on precise timekeeping and ground-based information; allowing for precise positioning well beyond near-Earth distances. The development of such a system has direct application for maintaining the line of sight to external occulters. Using visual information from beacons on the observing telescope and from the target star, our system provides the positional information needed to place the occulter between the telescope and the star. We propose to further develop our working prototype of this system and extend its use to the formation flying of suborbital vehicles and spacecraft. Extensive ground testing will advance our prototype to a level suitable for a suborbital demonstration. A demonstration of centimeter-precision alignment of a Suborbital Reusable Launch Vehicle at 100s of kilometers separation will prove the capabilities of the system and warrant an in-space demonstration. Our positioning system and the technology developed through this proposal has the potential to vastly improve the capabilities of formation flying. An improvement in the technology of precision formation flying of spacecraft is necessary for future success of external occulters and many future space missions.

Anticipated Benefits

Our positioning system and the technology developed through this proposal has the potential to vastly improve the capabilities of formation flying. An improvement in the technology of precision formation flying of spacecraft is necessary for future success of external occulters and many future space missions.



Visual Positioning System for the Formation Flying of Suborbital Vehicles and Spacecraft

Table of Contents

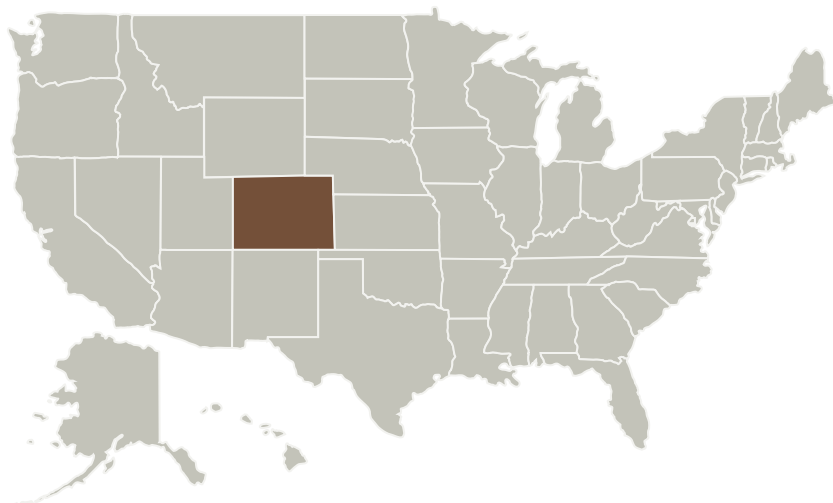
Project Introduction	1
Anticipated Benefits	1
Primary U.S. Work Locations and Key Partners	2
Project Website:	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	3
Technology Areas	3
Target Destination	3

Visual Positioning System for the Formation Flying of Suborbital Vehicles and Spacecraft

Completed Technology Project (2013 - 2016)



Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
University of Colorado Boulder	Lead Organization	Academia	Boulder, Colorado

Primary U.S. Work Locations

Colorado

Project Website:

<https://www.nasa.gov/directorates/spacetech/home/index.html>

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

University of Colorado Boulder

Responsible Program:

Space Technology Research Grants

Project Management

Program Director:

Claudia M Meyer

Program Manager:

Hung D Nguyen

Principal Investigator:

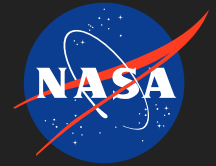
Webster Cash

Co-Investigator:

Anthony D Harness

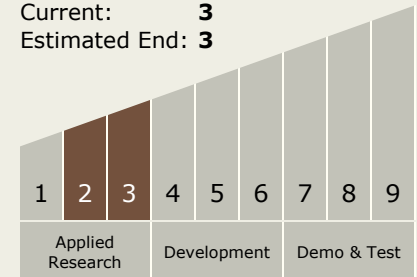
Visual Positioning System for the Formation Flying of Suborbital Vehicles and Spacecraft

Completed Technology Project (2013 - 2016)



Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.2 Observatories
 - └ TX08.2.3 Distributed Aperture

Target Destination

Earth